**Sustainable intensification and diversification of rice-based inland valley systems in the national rice basket of Tanzania**

*Concept note*

AfricaRice - AVRDC, 30 December 2011

**1. Background**

As part of the U.S. government’s Feed the Future initiative to address global hunger and food security issues in sub-Saharan Africa, the U.S. Agency for International Development (USAID) is supporting multi-stakeholder agricultural research projects to sustainably intensify key African farming systems and as a way of bringing a regional focus to the CGIAR’s Integrated Systems CRPs 1.1 and 1.2. The International Institute of Tropical Agriculture (IITA) is the lead institute for development and implementation. This research project focuses primarily on rice-production systems in North-West Tanzania but is intended to result in spill-over effects in other similar agro-ecological zones. This region was chosen based on analysis of cropping systems, poverty, population, country development priorities, and the potential for successfully improving agricultural productivity. The north-west of Tanzania, the area between Mwanza and Shinyanga also known as Sukumaland, is considered the national rice basket as 60% of all rice is produced there. The development of this region will be based around research in best management practices for sustainable intensification of production. This will require well-coordinated efforts involving multiple donors, regional organizations, partner universities, the private sector, national and international agricultural research institutes, and Non-Governmental Organizations (NGOs).

**2. Overall purpose and objectives**

Besides food insecurity and widespread poverty, environmental problems are becoming increasingly serious in Africa, differentiated by depletion and degradation of natural resources. Promising and largely unexploited land resources are the inland valleys, which cover an estimated 190 million ha. Depending on the country, only about 10-25% of these inland valley lowlands are currently used for agricultural production. However, increasing population pressure compounded by increasing number of dry spells are leading communities into uncontrolled and unskilled lowland exploitation. Sustainable use of lowland natural resources and services offers a prime opportunity to assure the food and environmental security of significant numbers of the rural poor.However, research and development challenges in inland valley lowlands are complex and diverse and cannot be dealt with by individuals or institutions acting alone. These challenges call for integrated, collective and concerted action including a wide range of institutions, conducive policies and cost-effective technological options for sustainable production, processing, and marketing.

Sukumaland, in the north-western part (Lake Zone) of Tanzania accounts for about 66% of rice cultivated in the country. Inland valley systems accommodate an important share of the rice production area in Sukumaland. Rice production systems in Sukumaland can be characterized as traditional and diversified with ample room for improved diversification (systems with a ‘better fit’), intensification (to improve production) and value-addition (strengthening the value-chain and improve incomes).

In rain-fed systems throughout Africa, intercropping is common especially for dryland crops, and is practiced primarily as a means of increasing crop production per unit land with limited capital investment and minimal risk of total crop failure. In lowland rice ecosystems, grain legumes or forage crops can be introduced as relay-intercropping crops towards the end of the wet season and when water levels go down. These crops may contribute to the generation of income, soil fertility improvement and the reduction of weed infestation in the subsequent rice growing season. Introduction of short-duration rice varieties, such as the ones generated and disseminated by AfricaRice and partners, may result in increased time availability for the relay-intercropping crops and hence increase their productivity. Crop rotation involves growing different crops in systematic and recurring sequences on the same land, as opposed to monoculture, in which a particular crop is planted repeatedly in the same field. On a seasonal basis, rotation can take place in the wet season, with rice being the most suitable crop for the wetlands, whereas during the dry season, dryland crops such as grain legumes and vegetables can be cultivated. The economic performance of different rotations and relay-intercropping systems varies according to the distance to markets, topo-sequence position in the inland valley, and water availability during the dry season. The combination of mechanized land preparation and water saving technologies with use of storage reservoirs could significantly contribute to increased water availability. Furthermore, post-harvest and value addition options can increase product competitiveness and raise farmers’ incomes. Rice is usually produced as a single crop per year under rain-fed conditions with a production cycle of between 3-6 months. Irrigation provides opportunities to increase the potential yields of rice in designated locations during the major production season while promoting diversification of selected high value crops in the off-season period by making use of residual water following harvesting of the main (rice) crop. Many paddy fields are left fallow during the 5 to 6 months off-season period despite the availability of water. Yetfield research shows that rice yields could be increased by more than 1 tha-1 when grown in rotation with other crops such as potato and horticultural crops. In this regard, vegetables are most appropriate for rice-based farming systems to diversify risks in the farming portfolio because of their higher farm gate values and ability to utilize residual water from the previous rice crop. It is estimated that growing rice with horticultural crops could procure average margins of $172ha-1 against $110ha-1 for rice alone[[1]](#footnote-2).

The development of more productive and sustainable rice-based cropping systems in designated irrigated regions is a way forward to reduce the pressure on rapidly degraded uplands by shifting cultivation to lowland systems without adversely affecting the environment and compromising productivity. This is likely to lead to improved soil fertility and soil structure, reduced pressure of weeds and reduced alternative hosts for diseases and pests[[2]](#footnote-3), resulting in increased rice yield.

Farm incomes are affected by low producer prices due to limited access to markets. Even in cases where farmers are able to access markets, farmers are typically affected by lower producer prices for their produce during peak production periods driven by excessive supply beyond consumer demand. This can be compensated for by the development of small-scale storage and processing enterprises to add value and reduce losses and by enhancing market access of complementary crops, such as vegetables, legumes. Diversified and increased income from non-rice crops or livestock products, especially during the off season, reduces farm household pressure to sell rice thereby ensuring year round household food security. In addition, increasing household consumption of nutrient-rich vegetables - which contain essential micronutrients, bioactive compounds, and often proteins – and animal products alongside staples would increase household dietary diversity and would serve as the most cost-effective and sustainable solution to counter the hidden food crisis of micronutrient deficiencies in human diets.

**3. Geographic focus**

The project locations in Tanzania will be identified with partners during the January 2012 workshop. Links will be sought with project locations of other, similar initiatives in both areas.

**4. Project implementation strategy**

AfricaRice has an extensive network in sub-Saharan Africa. Most if not all rice experts in the region have benefited from training and collaborative activities with the Center. AVRDC has established collaborative networks on vegetable research and development activities with a number of public and private sector partners and trained staff of selected private seed companies.

This project uses an innovation systems approach to research and responds to the call in the Framework for African Agricultural Productivity (FAAP) developed by the Forum for Agricultural Research in Africa (FARA) of making a *paradigm shift away from a principally technological package approach to a truly integrated agricultural research approach, ensuring that researchers (national and international) work together with smallholders, pastoralists, extension agencies, the private sector and NGOs to have impact on the ground.*

The current project builds on the achievements of the European funded project “Realizing the agricultural potential of inland valley lowlands in sub-Saharan Africa while maintaining their environmental services” (RAP). This two-year project was funded by the EU as part of the Annual Action Plan (AAP) 2008 through IFAD (Project number: SUPP-ECG 34 SWP-WARDA 2009-2010). It is coordinated by AfricaRice, and covers two West-African countries: Mali and Benin and will move in 2012 into its second phase. A similar project is planned to be carried out in northern Ghana and this will provide us with the opportunity to make cross-country comparisons which will enable scaling-up and –out excercises.

**5. Project outputs and activities**

**Goal**

The goal of this project is to improve livelihoods through sustainable intensification and diversification of rice-based systems in north-western Tanzania

**Purpose**

To enhance the productivity and competitiveness of inland-valley lowlands through sustainable intensification and diversification of agricultural productivity and product value chain development, while conserving land and water resources.

**Work Packages**

WP0: Project management, monitoring and evaluation

WP1: Participatory development of competitive, gender-sensitive and environmentally sound value chains in rice-based inland valley systems through multi-stakeholder platforms (MSPs)

WP2: Analysis of opportunities and risks related to agricultural production and environmental goods and services

WP3: Enhancement of rice-based production systems and process efficienciesthrough generation and implementation of innovative technologies that allow for sustainable intensification and diversification of productive resources linked to farm diversity

WP4: Support to development projects and the private sector promoting sustainable development of inland valley systems in Africa

**Main outputs per Work Package (WP):**

WP0: Project workshops, intra-project communication and monitoring are organized.

WP1: Constraints and profitability of existing rice-based production systems are assessed and competitive value chains for rice, rice by-products and other crops and products, and enhanced market access for smallholders are developed and promoted through multi-stakeholders platforms.

WP2: Spatial model in a GIS/remote sensing environment that is applicable on a national scale to determine agricultural potential and ecosystems services for agricultural development of inland valleys is developed and applied.

WP3: Innovations that enhance productivity and resource-use efficiency through intensification and diversification while maintaining environmental goods and services are developed, or locally adjusted, and implemented.

WP4: Successful innovations adopted by the private sector, NGOs and development projects focused on sustainable development of inland valley systems.

**Activities and output targets per WPand time line**

*WP0: Project management, monitoring and evaluation*

*Activities*

Years 1-5:

* Organization of inception and yearly planning workshops
* Identification of M&E indicators and baseline study
* Backstopping visits by AfricaRice and AVRDC to key sites
* Participation of project staff in yearly meetings of the Inland Valley Community of practice (IVC) to exchange experiences and discuss progress
* Yearly M&E

*Output targets*

Years 1-5:

* Work plans further elaborated and detailed for each WP.
* Research methodologies harmonized
* Workshops organized
* Annual work plans developed
* Yearly M&E of progress made

*WP1: Participatory development of competitive, gender-sensitive and environmentally sound value chains in rice-based inland valley systems through multi-stakeholder platforms (MSPs)*

*Activities*

Years 1-2:

* Diagnostic surveys to identify constraints of existing rice-based production systems and to assess the profitability, through cash flow analysis, of best alternative rice-based cropping system
* Collect baseline information on current status of dietary consumption patterns and production and supply chains, traded volumes, marketing channels, processing practices and volumes among beneficiaries
* Value chain analysis for rice (paddy and by-products),vegetables, other crops and animal products
* Starting-up of MSP process at key-sites

Years 1-4:

* Evaluation of MSP effectiveness for improving production, marketing and management across the value chains
* Scaling-up and –out of MSP process from key sites to neighbouring communities

Years 4-5:

* Monitoring and evaluation assessment to evaluate adoption of agricultural innovations at all country sites
* Scaling-up and –out of MSP process and functioning to regional level
* Scaling-up and out of proven, cost effective and environmentally friendly innovations and novel institutional arrangements for higher productivity, incomes, food and nutritional security to enhance livelihoods

*Output targets*

Years 1-2:

* Diagnostic survey on opportunities and constraints related to collective action and governance of inland valley systems implemented
* MSPs established and effectiveness, efficiency and relevance for inland valley development compared among key sites
* Knowledge gap of stakeholders within MSPs identified
* Governance of agricultural products value chains analysed at key sites

Years 1-4:

* Effective, efficient value chains are established at key sites by promoting sound innovations and novel institutional arrangements aimed to increase and sustain productivity of the systems, raise income, improve gender equity, and promote good governance for attractive investments in the inland valleys of the project
* Characterize and develop effective linkages within the market value chains of rice-based (e.g. rice – vegetable, rice-livestock) farming systems
* Develop a low cost database of market information (including availability of commodities, prices, production packages etc.) through the innovative use of information technology (e.g. cell phone SMS)
* Videos for institutional arrangements for enhancing lowlands agricultural productivity developed

Years 3-5:

* Proven, cost effective and environmentally friendly innovations and novel institutional arrangements for higher productivity, income, food and nutritional security and enhanced livelihoods are scaled-up and out

*WP2: Analysis of opportunities and risks related to agricultural production and environmental goods and services*

*Activities*

Year 1:

* Start of PhD theses research on geospatial and environmental services of inland valley lowlands

Years 1-3:

* Remote sensing analysis to classify inland valleys from satellite imagery
* Field survey to support the validation of the remote sensing analysis
* Development of a spatial model and application in a GIS environment for the pilot areas
* Collection of essential data sets to feed the model from partners and government agencies
* Survey to validate the spatial model
* Development of a land and water use model for assessing ecosystem services

Years 4-5:

* Adjustment of methods and the classification of inland valleys from satellite images, based on results of the validation study
* Application of the model to assess the potential of inland valley systems at national scales in a GIS environment using the data sets collected
* Survey in different agro-climatic zones to validate the maps displaying the potential for development
* Evaluation of the model and development recommendations for further improvement

*Output targets*

Years 1-2:

* Bio‐physical and socio‐economic factors explaining success and failure in inland valley development in northern Tanzania documented.
* Remote sensing and GIS-based inland valley mapping procedures developed
* Land and water use analysis tools to assess ecosystem goods and services identified

Years 2-4:

* A spatial model is developed in a GIS environment to map inland valleys that have great potential for development.
* Nation-wide data sets are collected in a GIS that are required to apply the spatial model
* A validation study is prepared that will be conducted to test the results of the application of the spatial model
* Land and water use analysis tool to assess ecosystem goods and services tested

Years 4-5:

* National-scale maps of inland valleys are improved using the fieldwork and validation results of the previous year
* The spatial model is applied on a national scale using the validated spatial factors for success, the collected spatial thematic layers, and the developed inland valley maps
* A validation study is carried out in three selected test areas to provide recommendations for improvements of the model and applicability for other countries
* Land and water use analysis tool to assess ecosystem goods and services are tested and validated

*WP3: Development of innovative technologies that allow for sustainable intensification and diversification of productive resources linked to farm diversity*

*Activities*

Years 1-2:

* Start of PhD theses research on the organization and space-time evaluation of rice-based cropping systems in inland valley systems
* Yield gap surveys
* Analyse existing rice-based crop (other than rice) and livestock production

Years 2-4:

* Development of a first version of a basket of ‘good agricultural practices’ (GAP)
* Testing of GAP with farmers at key sites
* Assess the agronomic and economic performance of promising rice-based cropping systems by determining their economic returns per hectare under GAP through farmer participatory trials
* Evaluation of agronomic innovations (e.g. NERICA-L, rice-vegetable rotation, integrated rice-cattle production systems) for enhancing rice productivity under low-input conditions
* Evaluation of options for diversification of rice-based systems (rotations and relay-intercropping)

Years 3-5:

* Co-develop and disseminate (in collaboration with partners) GAP innovations to NARES, NGOs, farmers and other stakeholdersin rice-based systems that improve productivity and household livelihoods.
* Monitoring of farmer adoption

*Output targets*

Years 1-2:

* Farm diversity at regional level characterized (agronomic and socioeconomic data).
* Constraints and opportunities for rice-based diversified production systems are evaluated on-farm
* New rice-based cropping systems using participatory approaches (prototyping) are defined and proposed to MSPs to be tested to manage soil fertility, pest, and weeds

Years 2-4:

* Rice-based cropping systems using a participating approach (prototyping) to manage soil fertility, pest and weeds are tested. A validation study is prepared for the next year that will be conducted to assess the results with stakeholders
* Decision support systems to improve productive resource efficiencies in rice-based systems (e.g., land, water, labour, and inputs) are tested
* Agronomic innovations (GAP baskets) for enhancing productivity under low-input conditions are tested on farmer’s fields and the degree of adoption evaluated
* Rice-based diversified production options are tested and evaluated on-farm

Years 3-5:

* Agronomic innovations for enhancing productivity under low-input conditions are validated in farmer’s fields and disseminated (GAP baskets)
* Improved rice-based cropping systems using participatory approaches (prototyping) to manage soil fertility, pest and weeds are validated
* Decision support systems to improve productive resource efficiencies in rice-vegetable, rice-legume or rice-livestock systems (land, water, labour, inputs) are validated and upgraded

*WP4: Support to development projects promoting sustainable development of inland valley systems in Africa*

*Activities*

Years 3-5:

* Development of ready-to-use products for different audiences, in particular extension agents from government organizations, development projects, NGOs, and the private sector
* Develop videos on institutional change for enhancing lowlands agricultural productivity
* Develop linkages with members of IVC for validation and diffusion of tools and methods obtained
* Development of linkages with private sector and development projects

*Output targets*

Years 3-5:

* Proven, cost effective and environmentally friendly innovations and novel institutional arrangements for higher productivity, incomes, food and nutritional security and enhanced livelihoods are disseminated
* Linkages with other members of IVC for validation and diffusion of tools and methods obtained are developed
* Videos for institutional change for enhancing lowlands agricultural productivity are available and disseminated in AfricaRice member states
* Linkages established with private sector partners and development projects
* Promote mutually beneficial linkages between major stakeholders and assist in policy formulation and advocacy
* Promote post-harvest technologies to improve farm household income and decision making through stabilization of sales prices at the farm gate level, as well as value-addition processing to increase profitability along the value chain

**6. Proposed partners**

The main target group is comprised of resource-poor smallholder farmers and their organizations in Tanzania and local entrepreneurs (product processors, traders, etc.). Change agents from NARES and NGOs will act as the main service providers and will thereby greatly benefit, as they will be exposed to new methods dealing with remote-sensing, integrated natural resource management, co-innovation, competitive product value chain development and multi-stakeholder platforms within the dynamic and diverse nature of inland valley systems.

The NARS of Tanzania (Lake Zone Agricultural Research Institute) will be responsible for planning and implementation of project activities. The NARS teams will be multi-disciplinary in the domains of agro-ecology, agro-economy, business development and socio-anthropology.Other actors include government agencies, NGOs, and private sector and development projects. AfricaRice as the convening center of the Inland Valley Community of practice will provide backstopping with respect to action-research, lowland NERICA varieties, lowland rice integrated crop management, remote sensing and GIS mapping procedure, water productivity and project management. AVRDC will contribute to development of sustainable rice-vegetable systems.

**7. Options for scaling out**

The typology of inland valley systems that will be developed in the first years of the project ensures that results can be scaled-out to appropriate recommendation domains (a function of e.g. degree of water control, distance to markets, degree of organization of producers etc.). The use of participative approaches and Multi-Stakeholder Platforms will ensure ownership of research results and rapid diffusion of knowledge beyond the key sites in each target country. Active linkages will be sought with development projects and the private sector. Videos will be used as a primary vehicle to out-scale results obtained. AfricaRice will also ensure that project results and methodologies are reported during annual meetings of the National Experts’ Committee (attended by representatives of AfricaRice’s 24 member countries) and the Inland Valley Community of practice (IVC).

In each work package, training sessions are planned in different key domains like water management, conception of sustainable cropping systems, value chain analysis, gender and equity, impact assessment and overall competitiveness of the cropping systems in the lowlands, for different type of trainees (researchers, technical agents, farmers, students). A minimum of 30% of participants in these training sessions will be women.

**8. Monitoring and evaluation**

AfricaRice will work with AVRDC and other partners to assist the project in defining indicators to be monitored yearly and conduct a base-line survey. Yearly workshops will allow for evaluation of results obtained and refining annual work plans.

**9. Project management**

The project will be supervised by AfricaRice as part of an on-going effort to develop inland valley systems in sub-Saharan Africa through the Inland Valley Community of practice (IVC). All activities will be conducted by national partners from Tanzania, with backstopping from AfricaRice and AVRDC. The project will have a national coordination unit chaired by a representative from LZARDI in Tanzania.

**10. Timeline**

See under section 5.

1. Agrifood Consulting International (2005) Development Strategy for the Rice Sector in Mozambique. Draft Final Report prepared for the CooperazioneItaliana, Maputo, Mozambique. Available online at: <http://www.agrifoodconsulting.com/.../MOZ%20Rice/MOZ%20Rice%20Trade%20Report-Final.pdf> [↑](#footnote-ref-2)
2. R. Kent, D. E. Johnson, M. Becker, The influences of cropping system on weed communities of rice in Cote d'Ivoire, West Africa, *Agriculture, Ecosystems & Environment*87(3): 299-307. [↑](#footnote-ref-3)